as a boat may be, by overloading with a substance denser than water, such as sand, gravel, or mud, but as this requires 1 pound of sand, for example, to every 7 pounds of ice, a proportion hundreds of times greater than that of the suspended matter to the water in even a muddy river, it is obvious that such sinking cannot occur on lakes, except rarely at the mouths of flooded streams, nor at all commonly anywhere else.

This sinking by overloading every one admits. The argument, and need for explanation, comes when it is insisted that honeycombed ice, wherever it may be, sinks like water-logged wood, and perhaps for the same reason.

This is too much for the physicist to take "lying down", for he refuses to believe that anything 10 percent lighter than water, as ice is, actually does or can sink in that water, whatever it may seem to do in the eyes of no matter how many witnesses. However, the ice does disappear. If it doesn't sink it must melt, but then how can it all melt in a few hours in the same water in which it had remained for weeks without melting?

To simplify the problem consider the behaviour of ice on a lake of moderate size in a region where the water remains frozen over through the winter. The matters of importance are:

1. When winter approaches the surface water cools, becomes denser and sinks until from bottom to top the water has the temperature appropriate to its maximum density, that is, 39° F., very nearly.

2. As the surface water is further cooled it becomes lighter and remains at the top where, presently, it freezes to ice, and in so doing expands by about one-tenth its original volume, and thus becomes approximately 10 percent lighter in the solid form than it was while in the liquid state. Hence it floats.

3. In the process of freezing the dissolved substances in the water (in lake and stream water there always are such substances) are at first expelled by the forming ice and later entrapped, in part, in the water between the crystal faces or in crevices of whatever kind.

4. With a little further cooling this interfacial and cavity concentrate, which always has a more or less lower freezing point than pure water, also is frozen and the sheet of ice thus rendered continuous and solid throughout, save for such air bubbles as may be present.

5. Under the influence of moderating weather and increasing sunshine as the spring days lengthen, the ice slowly warms up until its least pure portions, that is, those in the crystal cavities and over the crystal faces, melt—melt at a small fraction of a degree, often as little as one-thousandth of a degree, perhaps, below the freezing point of the purer ice. When this happens the bricks (crystals) still are solid, but the mortar that bound them together is fluid, and the whole structure weak. The ice has become rotten, as generally expressed, and soon more or less cracked, honeycombed, and water-logged. This last condition is partly, at least, caused by top-surface melting, and rain, perhaps.

6. Even yet there has been very little melting at the undersurface of the ice because there the water, being in contact with ice, is at the freezing (or melting) temperature 32° F. And because, owing to protection from winds by the sheet of ice, there is no wave action to bring up the denser, *warmer* water from below.

7. Comes a storm. The weak ice starts to break and soon is extensively broken. Then the churning action of the waves brings up an abundance of water of several degrees higher temperature than the melting point, and in the course of a few hours, or a day, at most, much of the ice, if not all of it, has melted away—gone so rapidly as to force the belief on most of us that it just must have sunk.

And this is how the ice sinks, "sinks" by melting quickly, on lake and on river, and the only possible way reasonably clean ice can sink. In short, while ice can be sunk by an overload of sand, or other dense material, all moderately clean ice, such as that on lakes, that has "sunk" hasn't sunk at all; it has just melted in a hurry. Even anchor ice didn't sink—it formed in place.

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